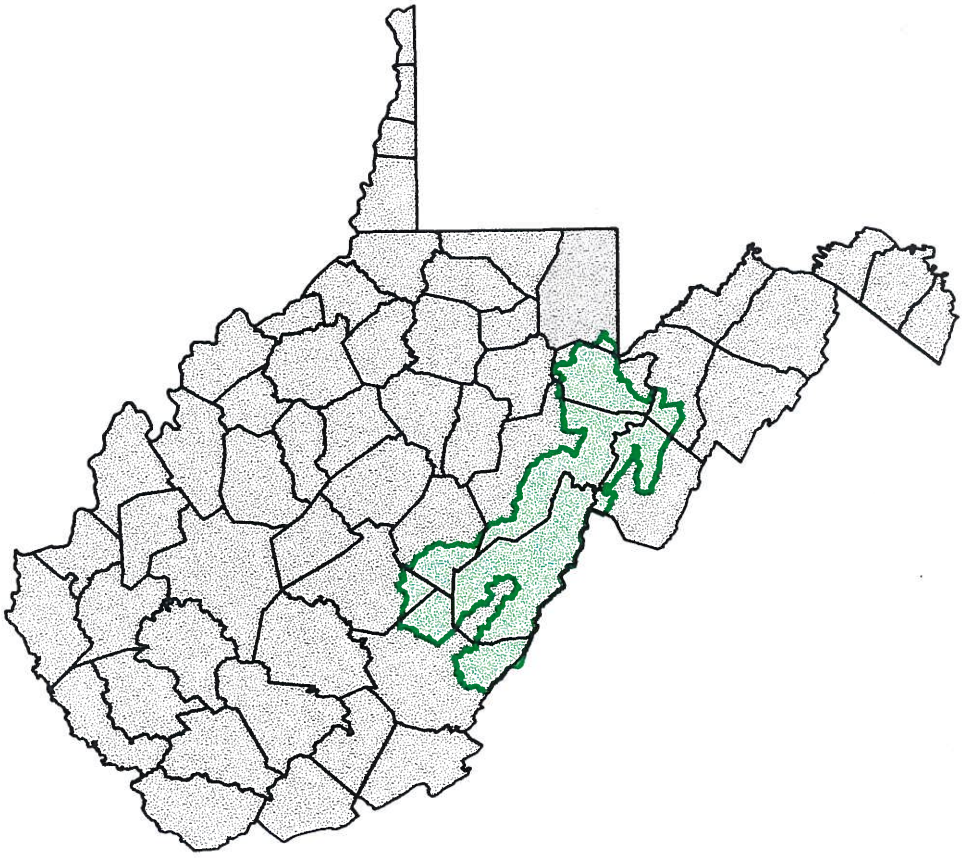
FILE

#194

Monongahela National Forest
Atlas of Gypsy Moth Treatments and Defoliation, 1990-1995



Susan DeLost
Robert Acciavatti
USDA Forest Service
Morgantown, WV
January 1997

Northeastern Area
State and Private Forestry

INTRODUCTION

Why a Gypsy Moth Atlas for the Monongahela National Forest?

The gypsy moth, Lymantria dispar, defoliated susceptible oak forests in West Virginia within the proclamation boundary of the Monongahela National Forest for the first time in 1990. That same year, the first aerial treatments with insecticide and/or pheromones were made to reduce the threat of repeated defoliations and the increased risk of tree mortality. Both treatments and defoliation continued for each of the next 5 years as the gypsy moth infestation spread over the northern half of the Forest. After the 1995 treatments and defoliation in unsprayed forests, the gypsy moth infestation collapsed throughout the northern portion of the Monongahela National Forest. The collapse was attributed to the rapid and widespread development of natural disease epizootics caused by the gypsy moth fungus, Entomophaga maimaiga, and the gypsy moth nucleopolyhedrosis virus.

This atlas documents where gypsy moth infestations occurred and where treatments were made each year from 1990 to 1995. Federally-owned lands of the Monongahela National Forest are emphasized. A general perspective of these gypsy moth infestations is provided by displaying defoliation on federal ownership within the proclamation boundary of the Monongahela National Forest (see maps on pages 5-8). The data used to produce the maps and summaries that appear in this atlas reside on the Forest Health Protection (FHP) Geographic Information System (GIS) at the US Forest Service office in Morgantown, WV. Similar data for non-federal lands within the MNF are stored on the FHP GIS, but are not included in the maps in this atlas.

The atlas is intended as a reference for Monongahela National Forest personnel interested in understanding the location, amount and reoccurrence of past gypsy moth infestations on their Forest. Persons involved in forest pest management activities, such as spray project planning, should find the atlas useful as background when preparing environmental assessments of future spraying.

TABLE OF CONTENTS

Page

Procedures. 1

Results 3

Monongahela National Forest Maps, Tables and Charts

Monongahela National Forest Map Index 4

Defoliation on Federally-Owned Lands, 1990-1995 5

Amount of Defoliation Annually, 1990-1995 9

Reoccurrence of Defoliation on All Ownerships. 10

Reoccurrence of Defoliation on Federal Ownership 11

1990 Treatment Blocks and Defoliation on Federal Ownership . . . 12

1991 Treatment Blocks and Defoliation on Federal Ownership . . . 14

1992 Treatment Blocks and Defoliation on Federal Ownership . . . 16

1993 Treatment Blocks and Defoliation on Federal Ownership . . . 18

1994 Treatment Blocks and Defoliation on Federal Ownership . . . 20

1995 Treatment Blocks and Defoliation on Federal Ownership . . . 22

PROCEDURES

How was this Gypsy Moth Atlas Made?

Summaries and maps in this atlas were generated using ARC/INFO and ArcView Geographic Information System (GIS) software. Because the collection of data spanned six years, several government agencies, programs, and associated personnel were involved in the data collection and input into the GIS. Two slightly different 1:24,000 scale topographic map (quad) series were used as the base for delineation of gypsy moth treatments and defoliation. One map series used was produced by the United States Geological Survey (USGS) and the other was produced by the United States Forest Service (USFS) and is known as the Primary Base Series (PBS) map. The main difference between the two map series is that the green tint on the USGS maps indicates wooded/forested areas while the green tint on the USFS PBS maps indicates federal ownership of National Forest lands.

Ownership. The Monongahela National Forest (MNF) proclamation boundary data layer was digitized by Forest Health Protection Staff in Morgantown, WV, using the Forest Service PBS maps as the base. The Forest ownership layer depicting federal and non-federal lands was also digitized from Forest Service Primary Base Series maps and was obtained from the Entomology Staff at Virginia Polytechnic Institute (VPI), Blacksburg, VA. The VPI Staff obtained the ownership layer from the US Forest Service's Geometronics Service Center, Salt Lake City, UT, as part of the digital Cartographic Feature Files (CFFs). The CFFs contain many layers of data on the Forest - ownership is just one of the layers. At VPI, the CFFs were converted into ARC/INFO coverages and were edited. The ownership layer contained in the Cartographic Feature Files was used in this atlas to determine the status of ownership (federal/non-federal) on the Forest. Other data layers (treatments and defoliations) were combined with the CFF ownership layer and subsequently coded for ownership based on the CFF designation. The Monongahela National Forest Map Index on page 4 shows these federally-owned lands within the proclamation boundary. Note that the Cartographic Feature Files may not contain the most recent Forest acquisitions; most notably for this atlas, the Dolly Sods North purchase unit.

Defoliation. Although gypsy moth defoliation has occurred in West Virginia since 1986, no gypsy moth defoliation occurred within the Monongahela National Forest prior to 1990. Defoliation was observed aerially by West Virginia Department of Agriculture (WVDA) staff who sketchmapped polygons representing defoliation onto 1:24,000 scale USGS topographic maps. For the years

before 1993, the defoliation data was digitized by US Forest Service and West Virginia University Department of Geology and Geography Staff, Morgantown, West Virginia, under the Appalachian Integrated Pest Management (AIPM) Gypsy Moth Demonstration Project. After 1993, defoliation data was digitized by WVDA staff and provided to the Forest Service upon request. Only defoliation reported in timber and recreation areas and in spray blocks of the Monongahela National Forest have been verified through on-the-ground observation by Monongahela National Forest or Forest Health Protection staff.

Treatments. Gypsy moth spray blocks were delineated on USGS topographic maps or Forest Service PBS maps (both at 1:24,000 scale). Treatments by WVDA on private lands within the proclamation boundary of the Monongahela National Forest are not depicted in this atlas. For 1992 and earlier, treatment blocks were delineated by WVDA staff and the resulting polygons were digitized under the auspices of AIPM for all ownerships within the proclamation boundary of the Forest. However, since 1993, treatment blocks have been delineated on Forest Service PBS edition maps, and digitized by Forest Health Protection for only Monongahela National Forest lands. In areas where federal and non-federal lands are adjacent, some data discrepancies may occur due to the use of the two different base maps. The digitized ownership layer from the Cartographic Feature Files became available only after data analyses for the atlas were started. This likely accounts for the reporting of acres on federal ownership treated with the chemical insecticide Dimilin in 1993 when only WVDA sprayed this insecticide on private lands within the proclamation boundary. Also, it would explain the small defoliated area reported in 1995 when the Monongahela National Foreest treated with the biological insecticide Bacillus thuringiensis (Bt).

What More should You Know about the Data?

The subjective nature of rendering defoliation from aerial sketchmapping, and the contrasting methods of calculating acreage between mechanical (planimeter) and electronic computer process (GIS), are factors which have affected the calculation of acres treated and defoliated. It was found that slight (<5%) differences exist in the acreage reported in the charts of defoliation and treatment acreage compared to those reported in the "History of Gypsy Moth Defoliation on the Monongahela National Forest, 1993-1995" by US Forest Service, Northeastern Area, Forest Health Protection (FHP), Morgantown, West Virginia.

RESULTS

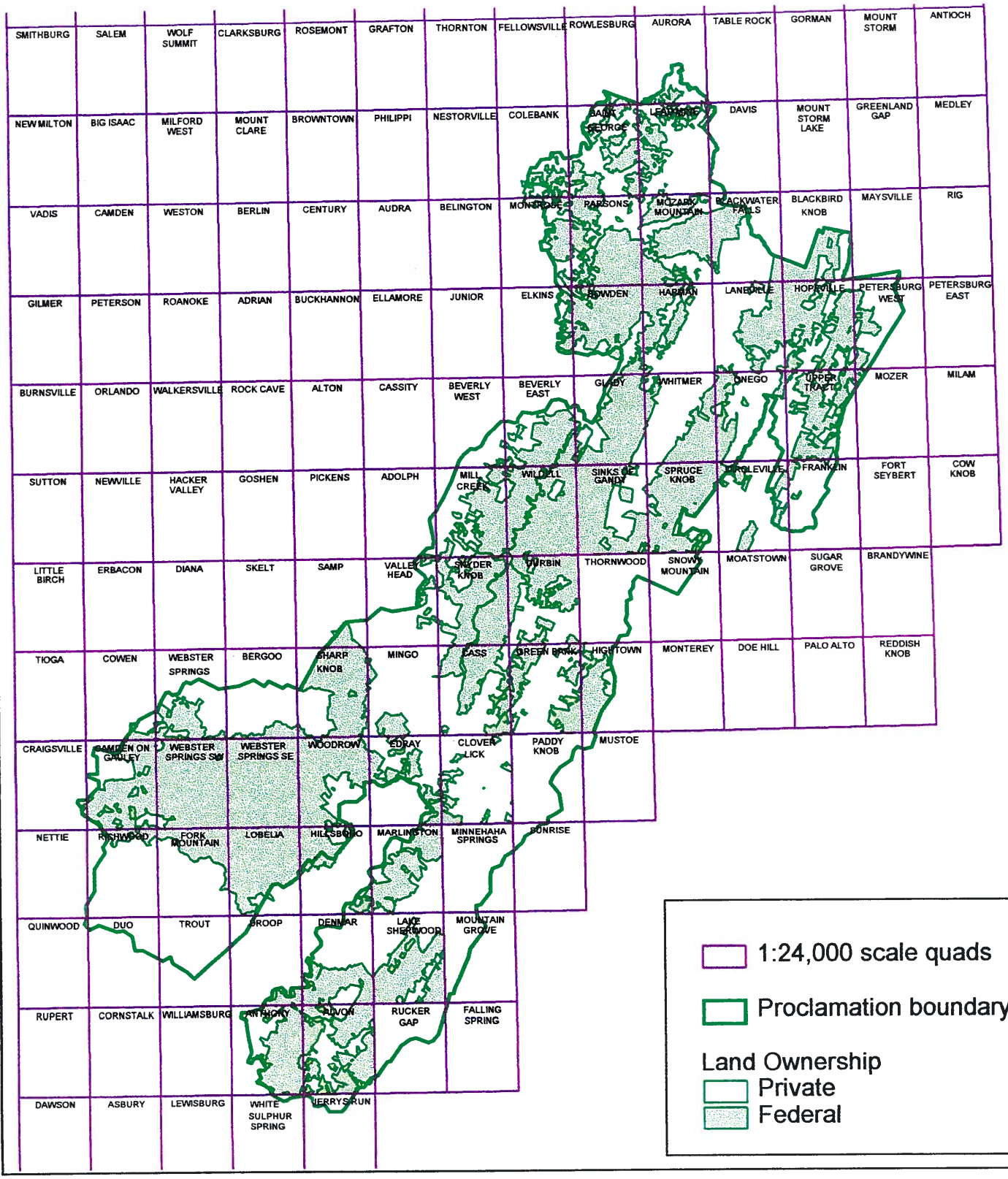
Where was the Gypsy Moth Defoliation on the Monongahela National Forest, When did Defoliation Occur, and How Long did Defoliation Last?

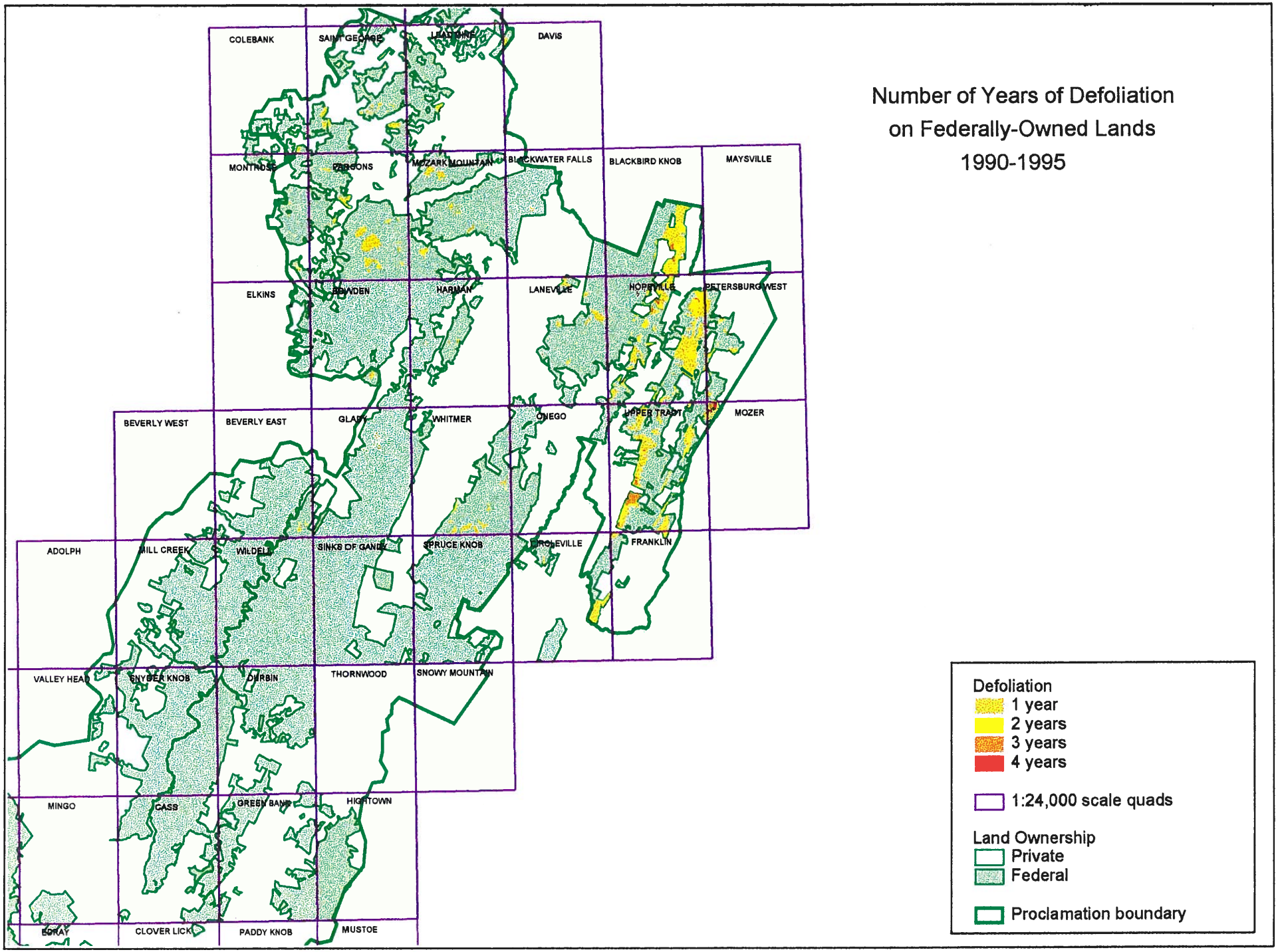
Pages 5 to 11 present gypsy moth defoliation maps, summaries, and charts for the years from 1990 through 1995. The maps depict the location of the defoliation on federally-owned lands within the proclamation boundary of the Monongahela National Forest. Data in the tables and charts show the amount (acres) of defoliation and its reoccurrence (years on the same acre) and can be compared between non-federal and federally-owned forests within the Monongahela National Forest.

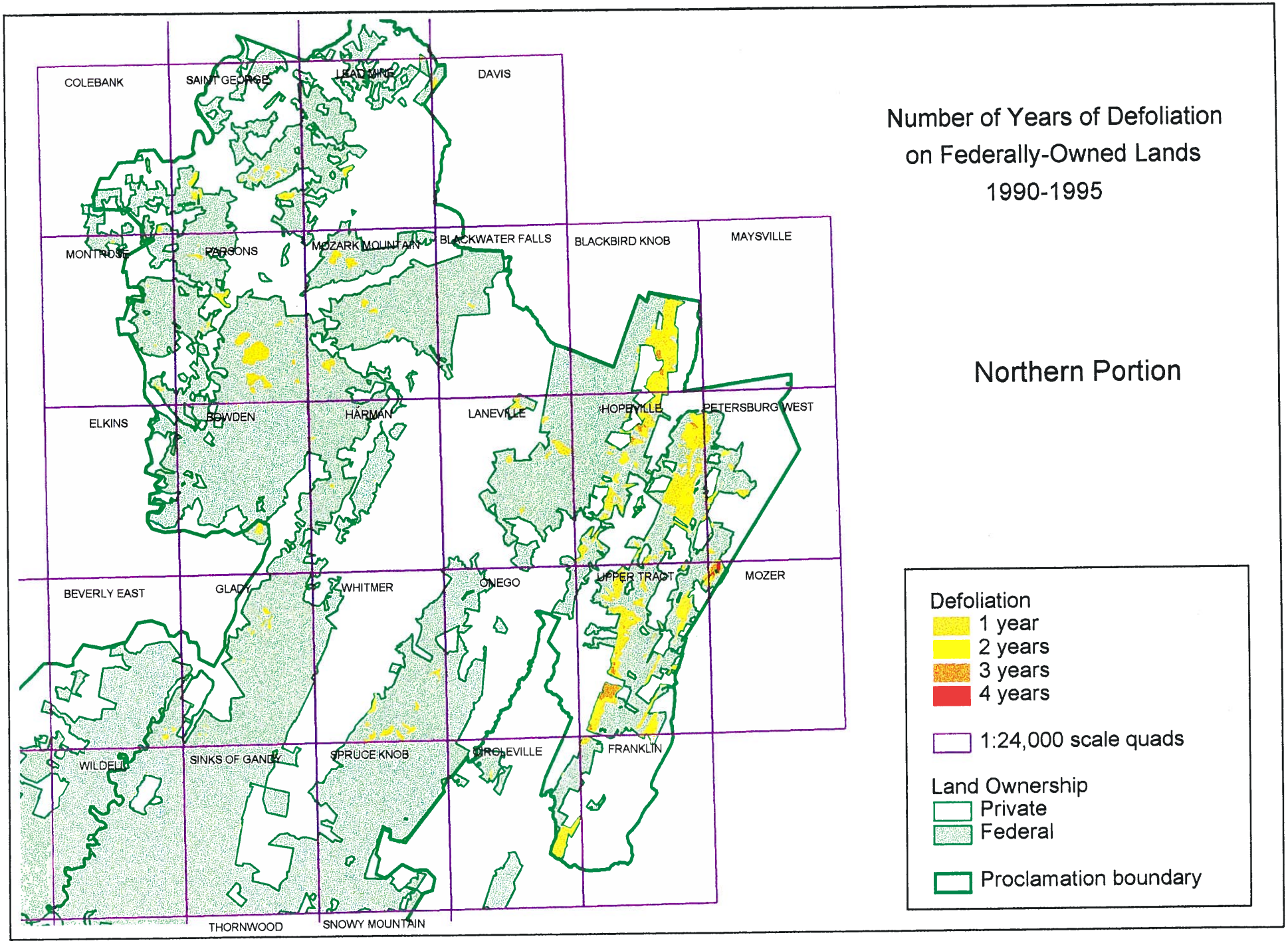
Which Areas of the Monongahela National Forest were Treated each Year and How much Defoliation Occurred in the Treated Areas?

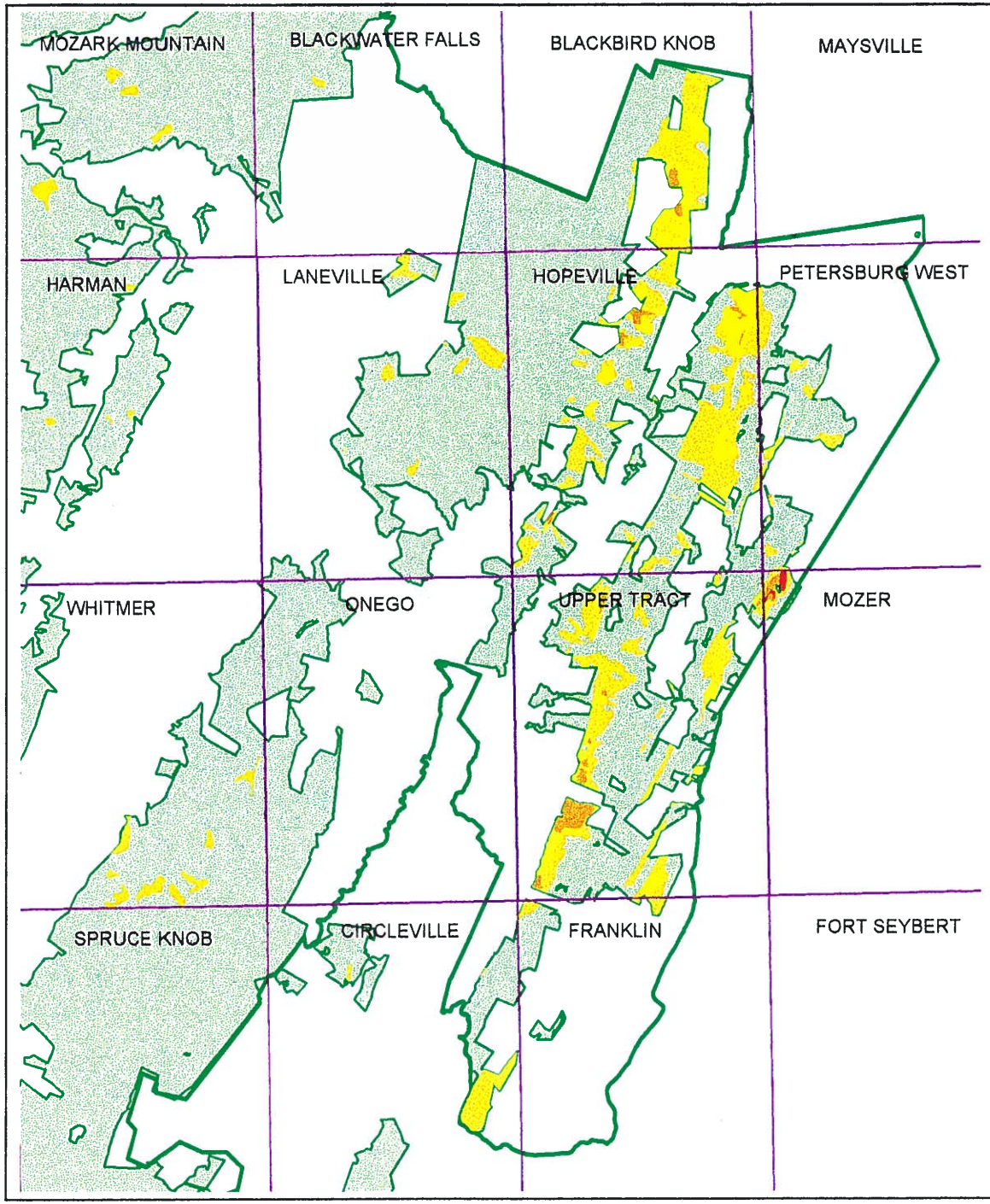
Pages 12 to 25 present gypsy moth defoliation maps, summaries, and charts for each year from 1990 through 1995. The maps and data indicate the extent (percent) to which the defoliation occurred within gypsy moth spray project blocks on federal lands of the Monongahela National Forest.

Monongahela National Forest
Map Index




Number of Years of Defoliation
on Federally-Owned Lands
1990-1995
COLEBANK
SAINT GEORGE
DAVIS
MONTROSE
PARSONS
MOZARK MOUNTAIN
BLACKWATER FALLS
BLACKBIRD KNOB
MAYSVILLE
ELKINS
BOWDEN
HARMAN
LANEVILLE
HORNER
PETERSBURG WEST
BEVERLY WEST
BEVERLY EAST
GLADY
WHITMER
ONEGO
UPPER TRADT
MOZER
ADOLPH
MILL CREEK
WILDELL
SINKS OF GANDY
SPRUCE KNOB
FRANKLIN
VALLEY HEAD
SNYDER KNOB
DURBIN
THORNWOOD
SNOWY MOUNTAIN
MINGO
CASS
GREEN BANK
HIGHTOWN
CLOVER LICK
PADDY KNOB
MUSTOE
Defoliation
1 year
2 years
3 years
4 years
1:24,000 scale quads
Land Ownership
Private
Federal
Proclamation boundary


COLEBANK
SAINT GEORGE
LEADMINE
DAVIS
MONTROSE
PARSONS
MOZARK MOUNTAIN
BLACKWATER FALLS
BLACKBIRD KNOB
MAYSVILLE
ELKINS
BOWDEN
HARMAN
LANEVILLE
HOPEVILLE
PETERSBURG WEST
BEVERLY EAST
GLADY
WHITMER
ONEGO
UPPER TRACT
MOZER
WILDELL
SINKS OF GANDY
SPRUCE KNOB
DIRGEVILLE
FRANKLIN
THORNWOOD
SNOWY MOUNTAIN
Number of Years of Defoliation
on Federally-Owned Lands
1990-1995
Northern Portion
Defoliation
1 year
2 years
3 years
4 years
1:24,000 scale quads
Land Ownership
Private
Federal
Proclamation boundary



Number of Years of Defoliation
on Federally-Owned Lands
1990-1995

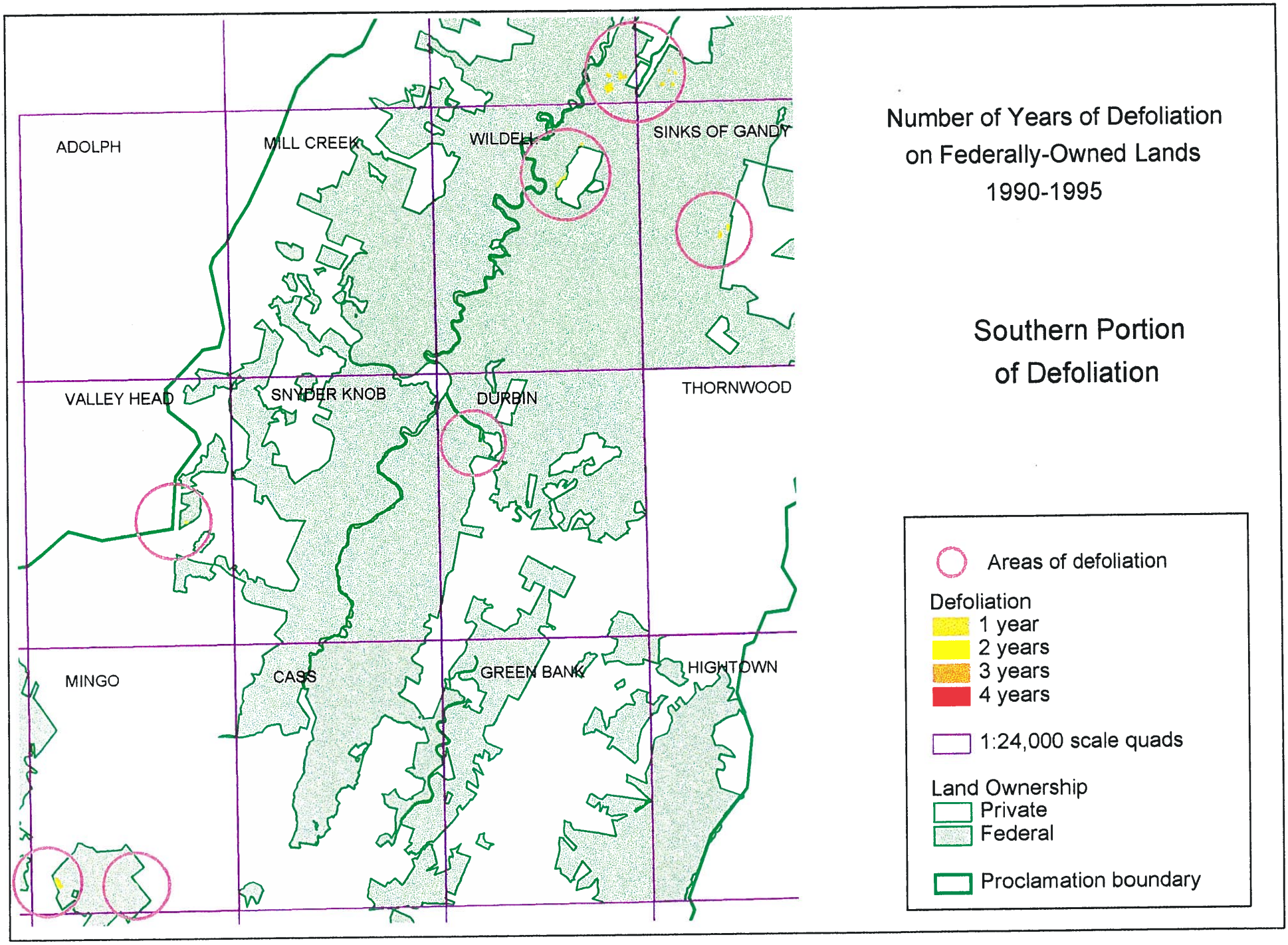
Eastern Portion

Defoliation
- 1 year
- 2 years
- 3 years
- 4 years

1:24,000 scale quads

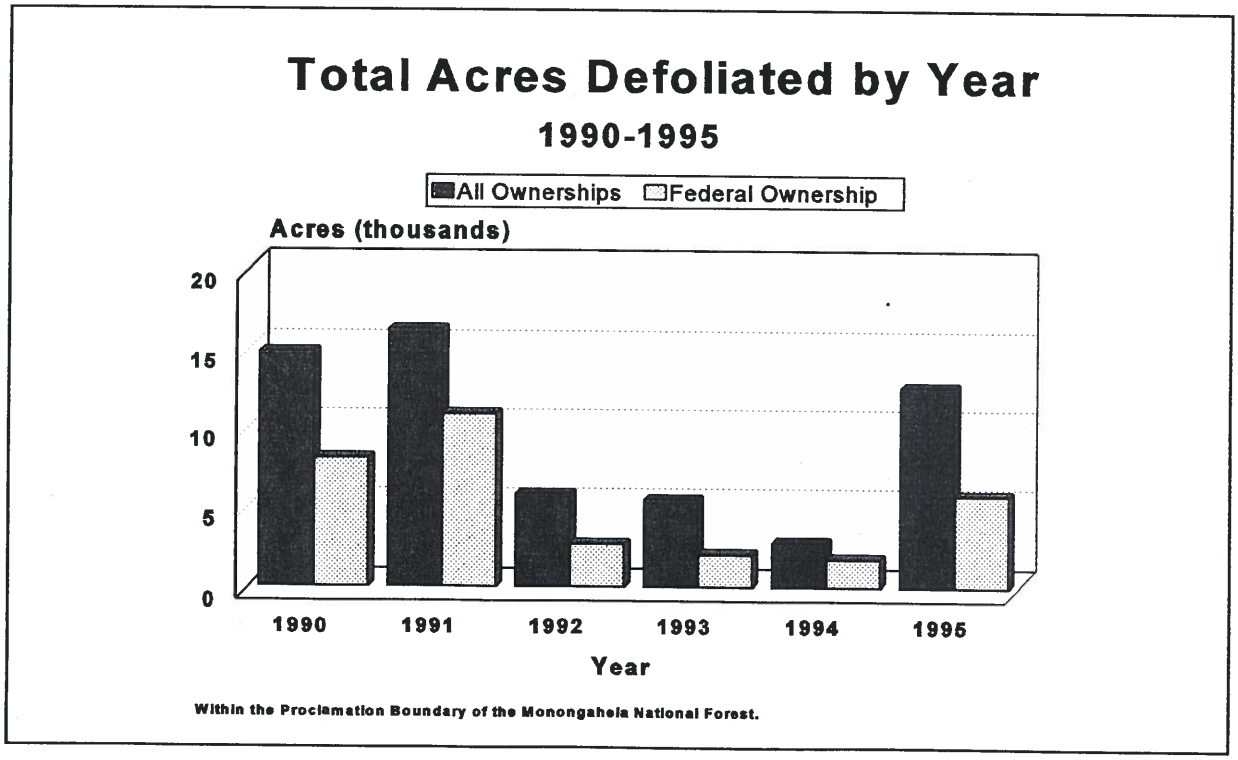
Land Ownership
- Private
- Federal

Proclamation boundary


ADOLPH
MILL CREEK
WILDELL
SINKS OF GANDY
VALLEY HEAD
SNYDER KNOB
DURBIN
THORNWOOD
MINGO
CASS
GREEN BANK
HIGHTOWN
Number of Years of Defoliation
on Federally-Owned Lands
1990-1995
Southern Portion
of Defoliation
Areas of defoliation
Defoliation
1 year
2 years
3 years
4 years
1:24,000 scale quads
Land Ownership
Private
Federal
Proclamation boundary

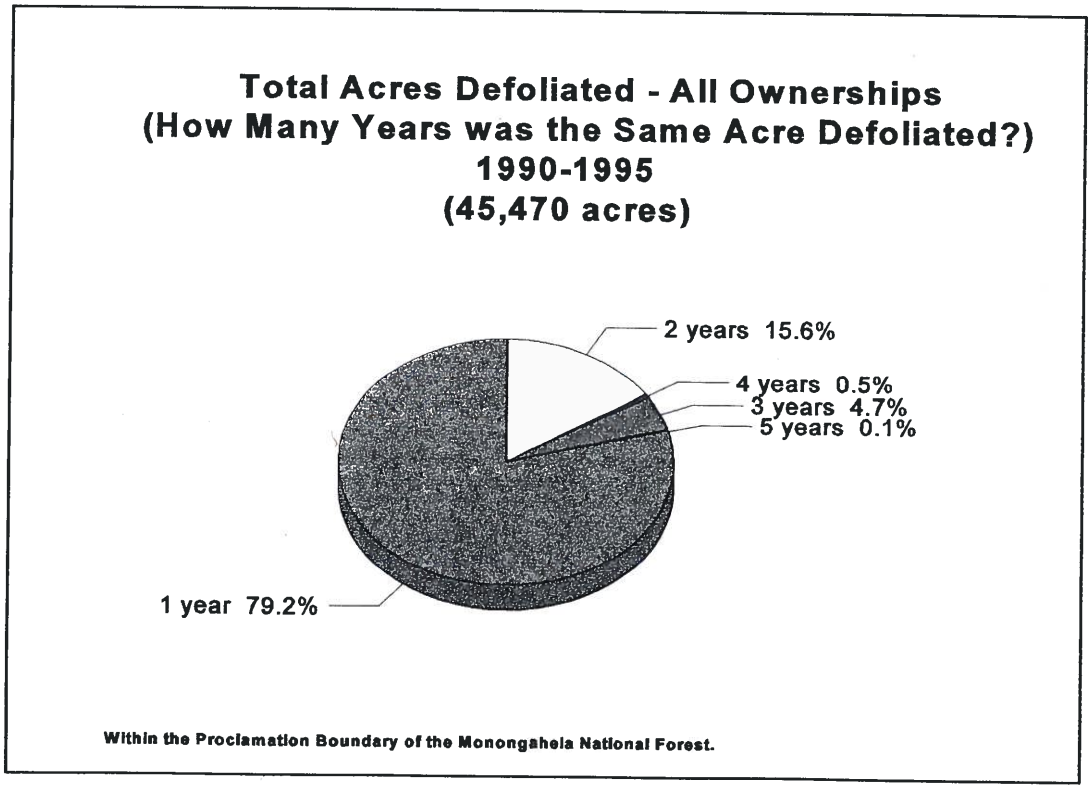
Amount (acres) of Gypsy Moth Defoliation within the Monongahela National Forest Proclamation Boundary Annually from 1990-1995.

Chronology of Gypsy Moth Defoliation	Defoliation All Ownerships (acres)	Defoliation Federal Ownership (acres)
1990	14,775	8,085
1991	16,249	10,847
1992	5,777	2,642
1993	5,418	2,019
1994	2,734	1,739
1995	12,603	5,699
5-Year Totals	45,470	24,650



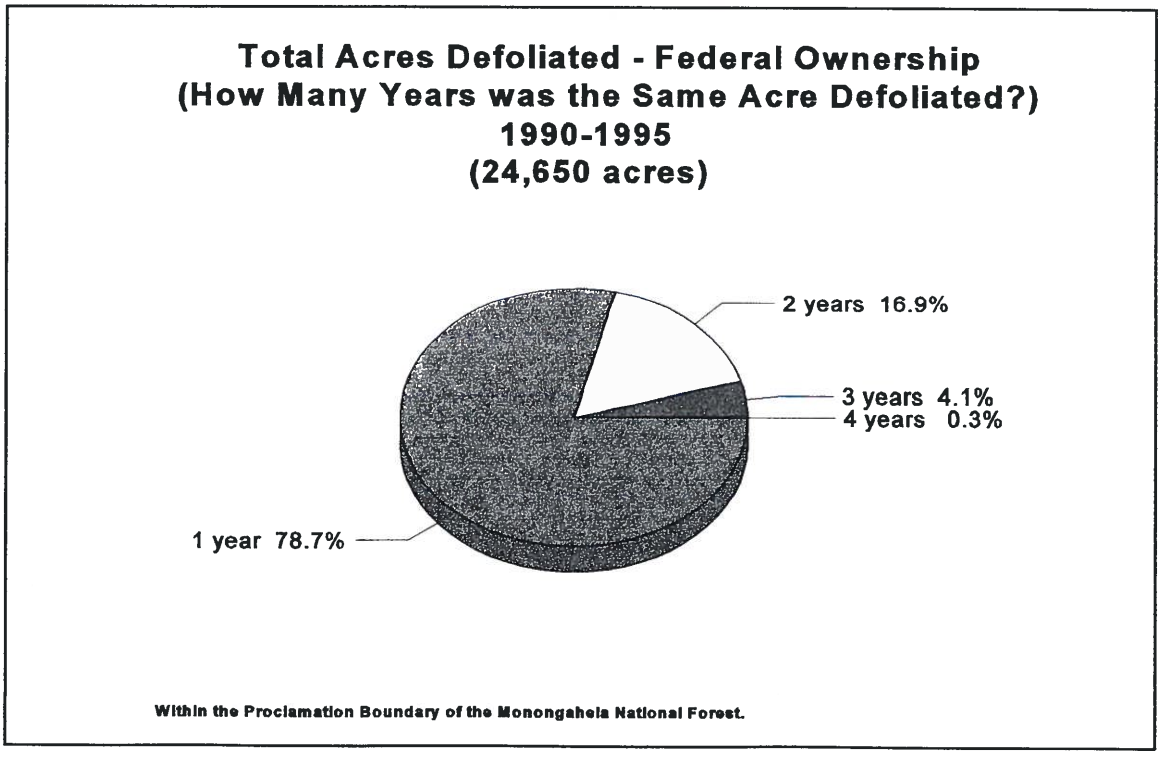
Reoccurrence (years on same acre) of Gypsy Moth Defoliation on Federal Ownership within Monongahela National Forest Proclamation Boundary, 1990-1995.

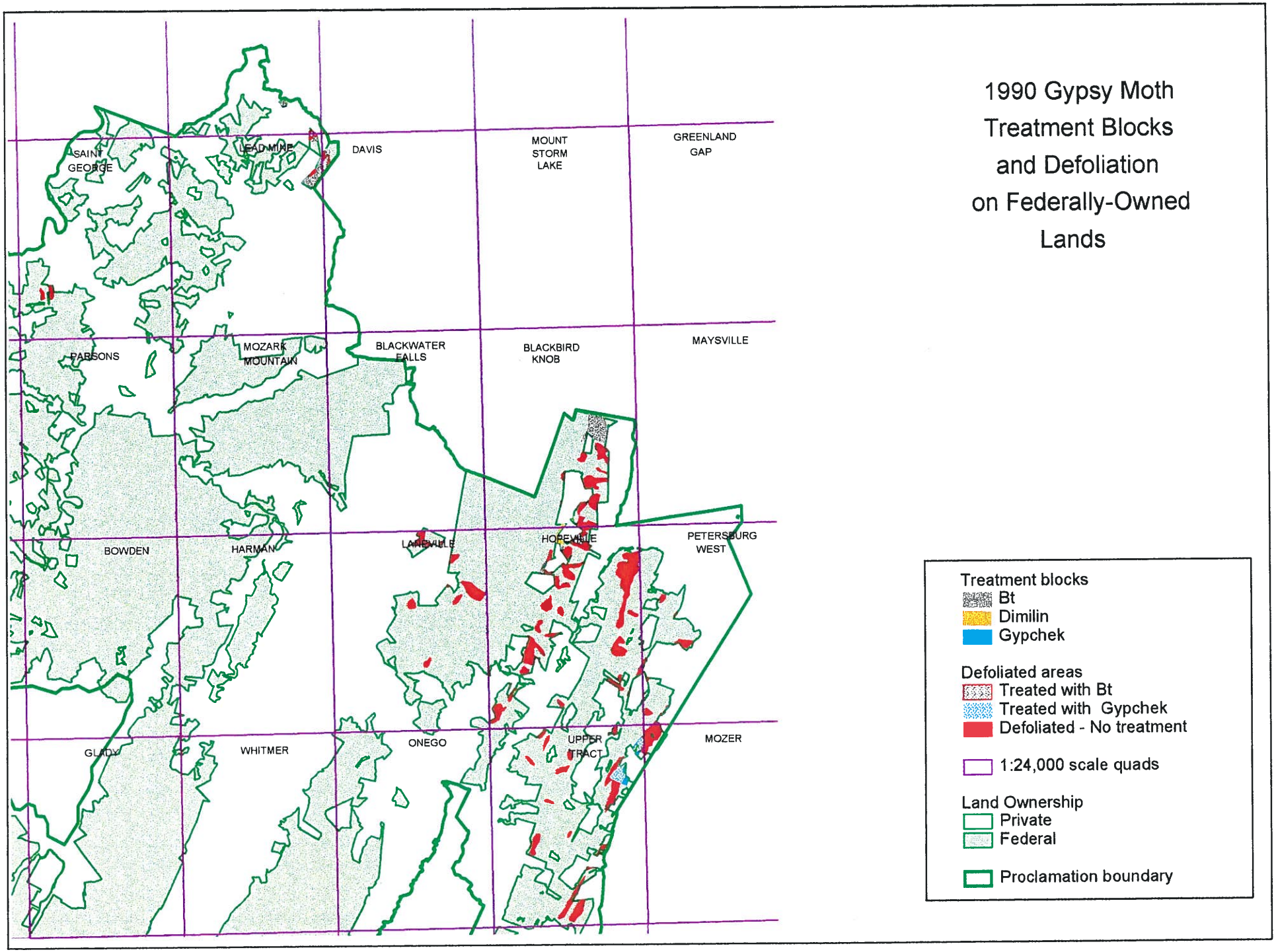
Reoccurrence (years)	Defoliation (acres)
1	36,001
2	7,108
3	2,219
4	205
5	26


Total Acres Defoliated - All Ownerships
(How Many Years was the Same Acre Defoliated?)
1990-1995
(45,470 acres)
2 years 15.6%
4 years 0.5%
3 years 4.7%
5 years 0.1%
1 year 79.2%
Within the Proclamation Boundary of the Monongahela National Forest.

Reoccurrence (years on same acre) of Gypsy Moth Defoliation on Federal Ownership within Monongahela National Forest Proclamation Boundary, 1990-1995.

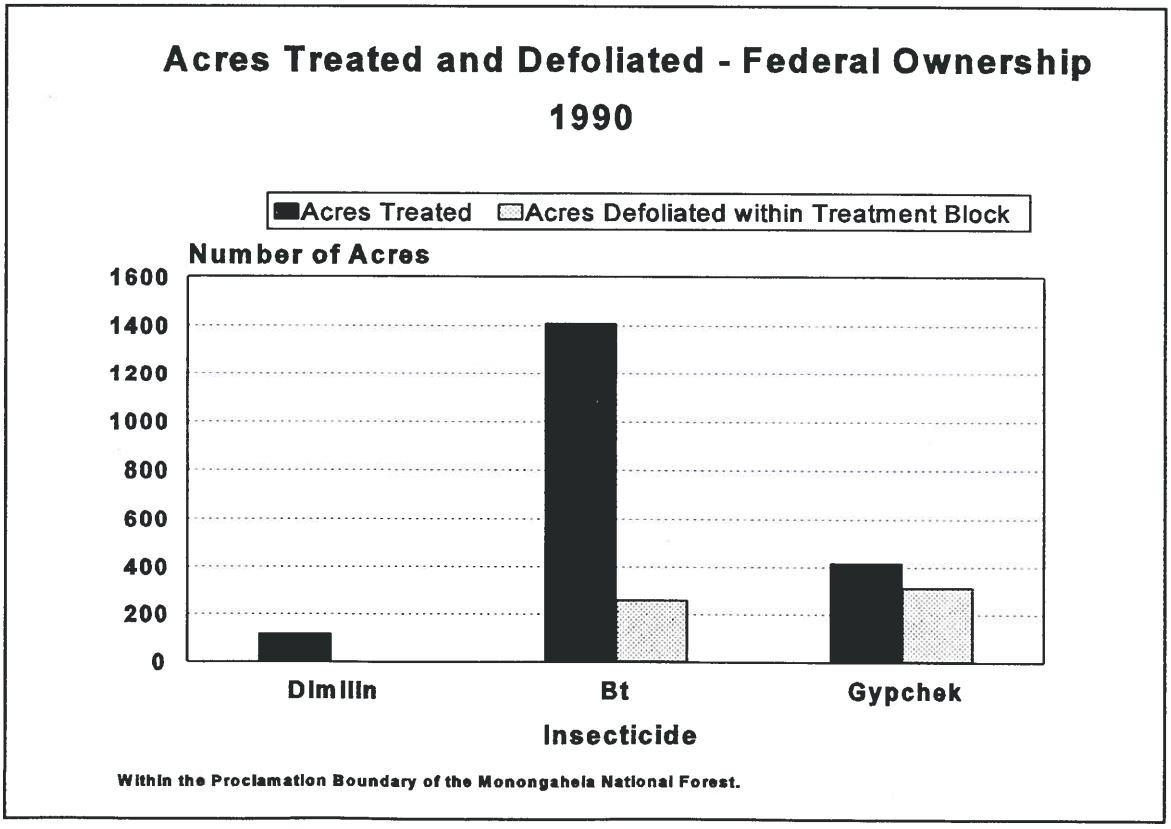
Reoccurrence (years)	Defoliation (acres)
1	19,404
2	4,174
3	1,011
4	62
5	0

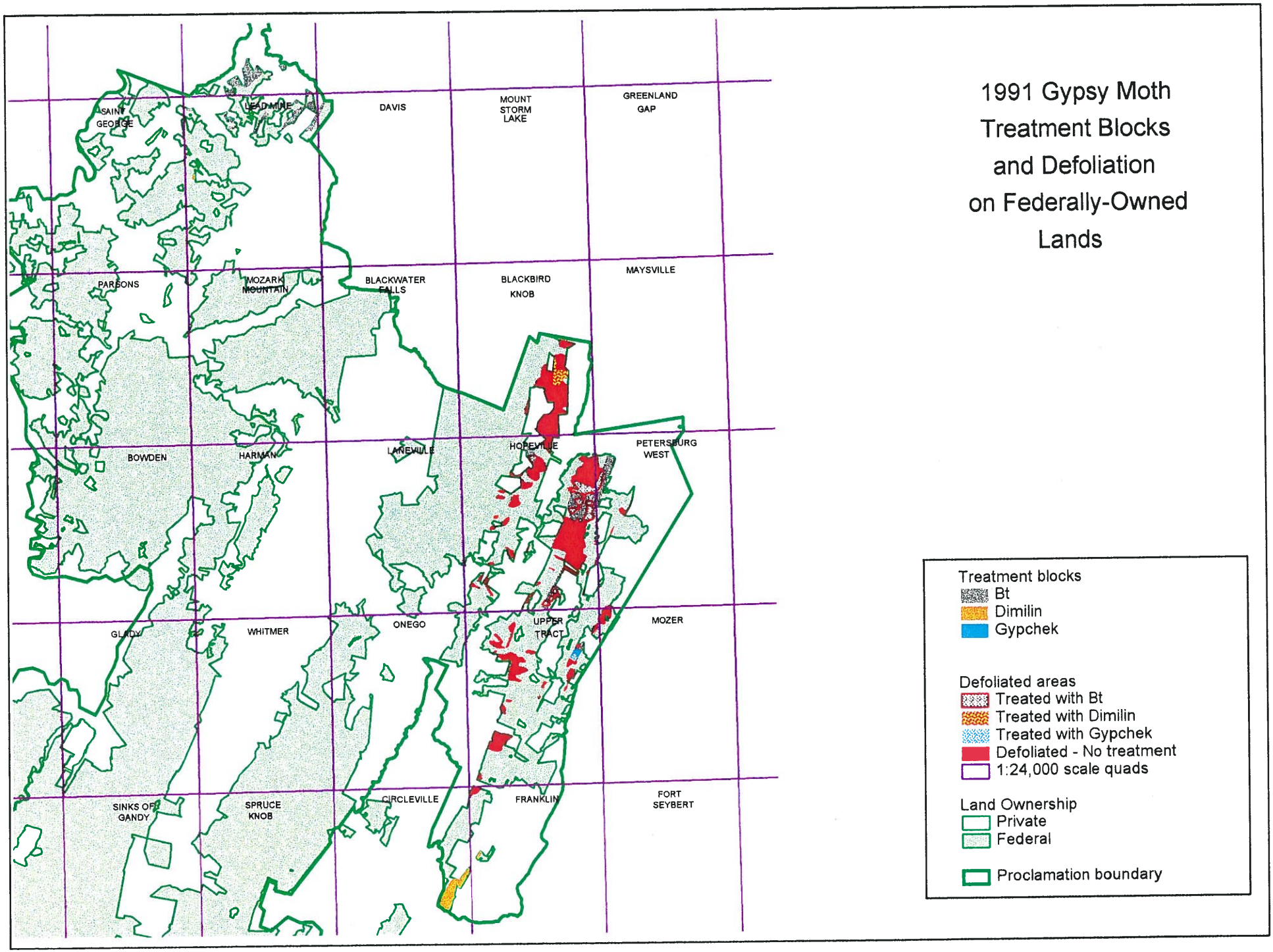

Total Acres Defoliated - Federal Ownership
(How Many Years was the Same Acre Defoliated?)
1990-1995
(24,650 acres)
2 years 16.9%
3 years 4.1%
4 years 0.3%
1 year 78.7%
Within the Proclamation Boundary of the Monongahela National Forest.


1990 Gypsy Moth
Treatment Blocks
and Defoliation
on Federally-Owned
Lands
SAINT GEORGE
LEAD MINE
DAVIS
MOUNT STORM LAKE
GREENLAND GAP
PARSONS
MOZARK MOUNTAIN
BLACKWATER FALLS
BLACKBIRD KNOB
MAYSVILLE
BOWDEN
HARMAN
LANEVILLE
HOPEVILLE
PETERSBURG WEST
GLADY
WHITMER
ONEGO
UPPER TRACT
MOZER
Treatment blocks
Bt
Dimilin
Gypchek
Defoliated areas
Treated with Bt
Treated with Gypchek
Defoliated - No treatment
1:24,000 scale quads
Land Ownership
Private
Federal
Proclamation boundary

1990 Gypsy Moth Defoliation (percent) in Treatment Blocks on Federal Ownership within Monongahela National Forest Proclamation Boundary

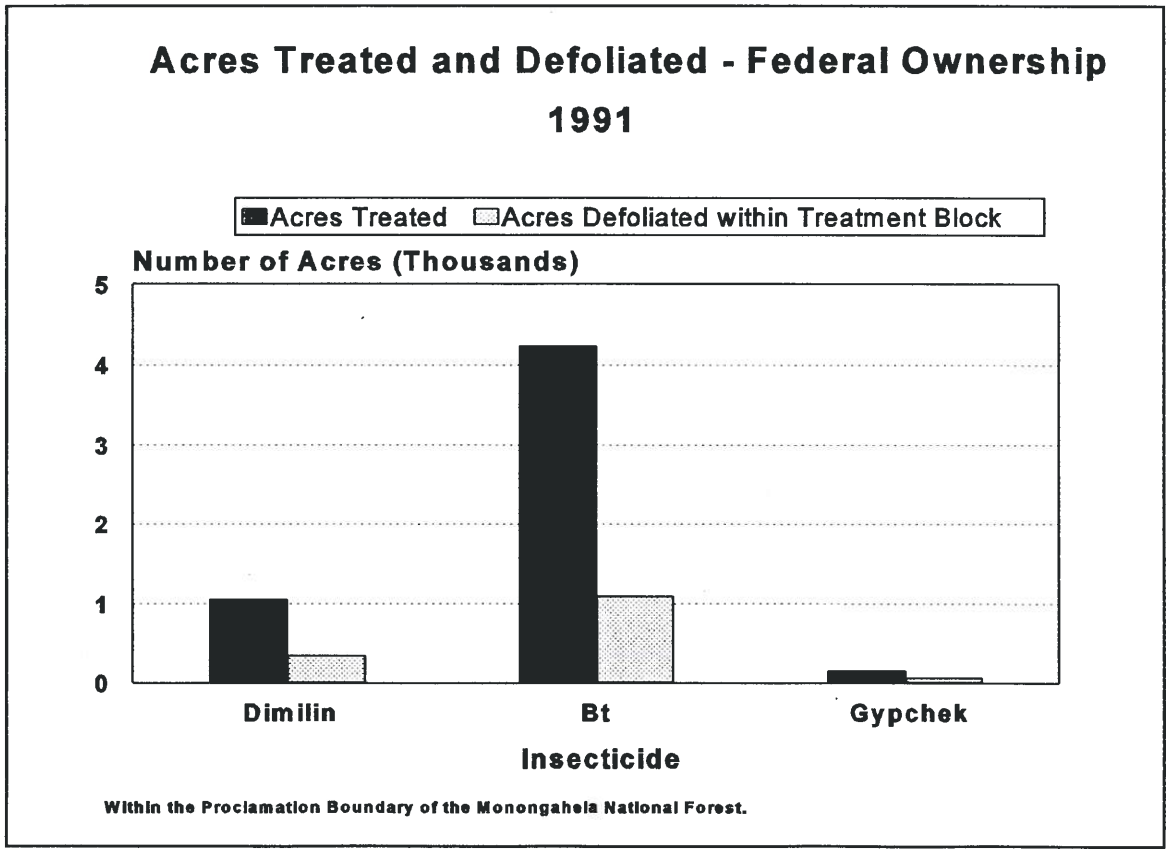
Year	Insecticide Spray Treatment	Total Treated in all Spray Blocks (acres)	Defoliation in all Spray Blocks (acres)	Portion of all Spray Blocks Defoliated (percent)
1990	Dimilin	117	0	0
	Bt	1,409	256	18
	Gypchek	417	309	74
Total		1,943	565	29

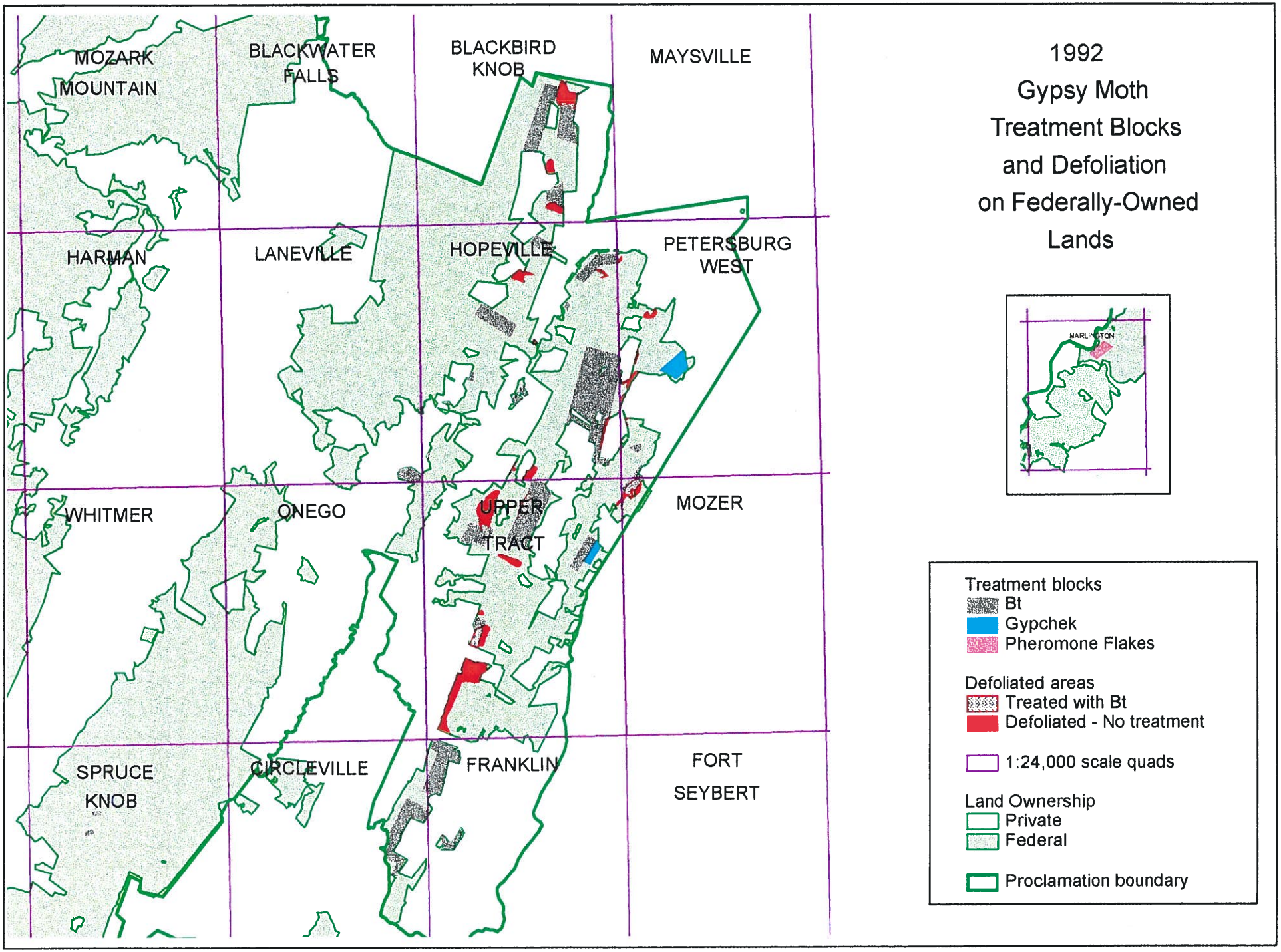



1991 Gypsy Moth Treatment Blocks and Defoliation on Federally-Owned Lands
SAINT GEORGE
LEADMINE
DAVIS
MOUNT STORM LAKE
GREENLAND GAP
PARSONS
MOZARK MOUNTAIN
BLACKWATER FALLS
BLACKBIRD KNOB
MAYSVILLE
BOWDEN
HARMAN
LANEVILLE
HOPEVILLE
PETERSBURG WEST
GLADY
WHITMER
ONEGO
UPPER TRACT
MOZER
SINKS OF GANDY
SPRUCE KNOB
CIRCLEVILLE
FRANKLIN
FORT SEYBERT
Treatment blocks
Bt
Dimilin
Gypchek
Defoliated areas
Treated with Bt
Treated with Dimilin
Treated with Gypchek
Defoliated - No treatment
1:24,000 scale quads
Land Ownership
Private
Federal
Proclamation boundary

1991 Gypsy Moth Defoliation (percent) in Treatment Blocks on Federal Ownership within Monongahela National Forest Proclamation Boundary

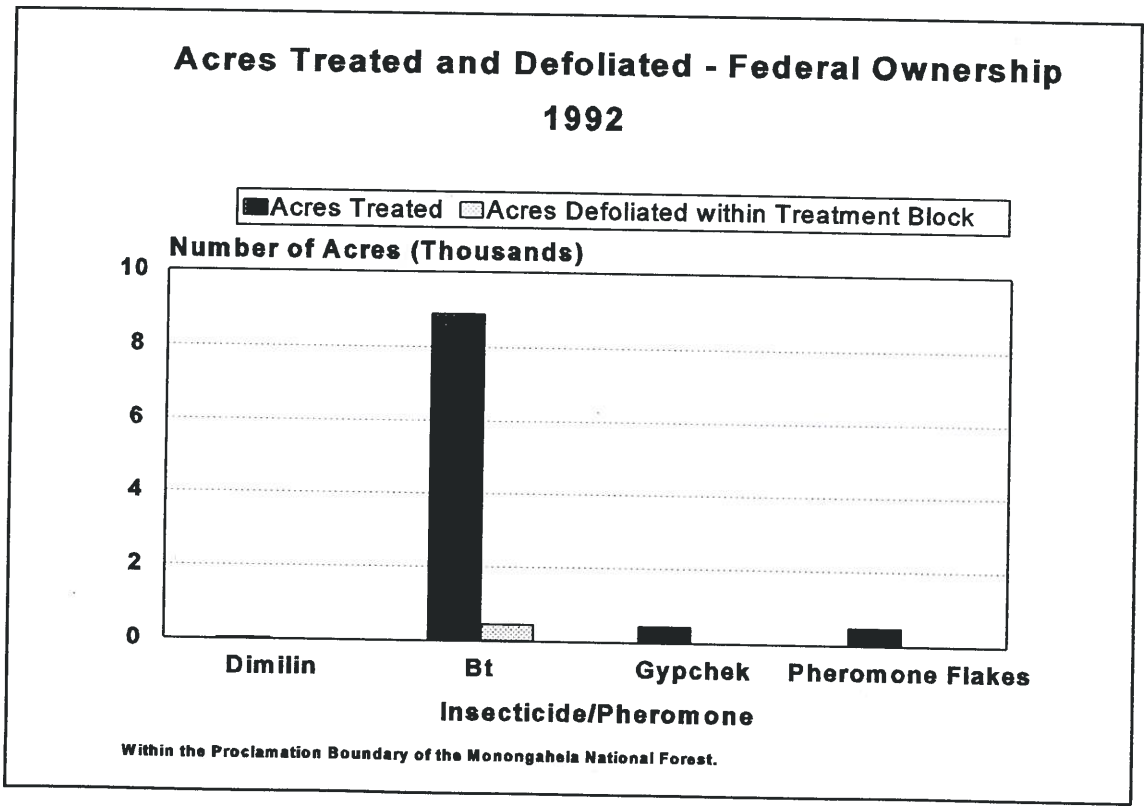
Year	Insecticide Spray Treatment	Total Treated in all Spray Blocks (acres)	Defoliation in all Spray Blocks (acres)	Portion of all Spray Blocks Defoliated (percent)
1991	Dimilin	1,056	350	33
	Bt	4,227	1,096	26
	Gypchek	153	61	40
Total		5,436	1,507	28

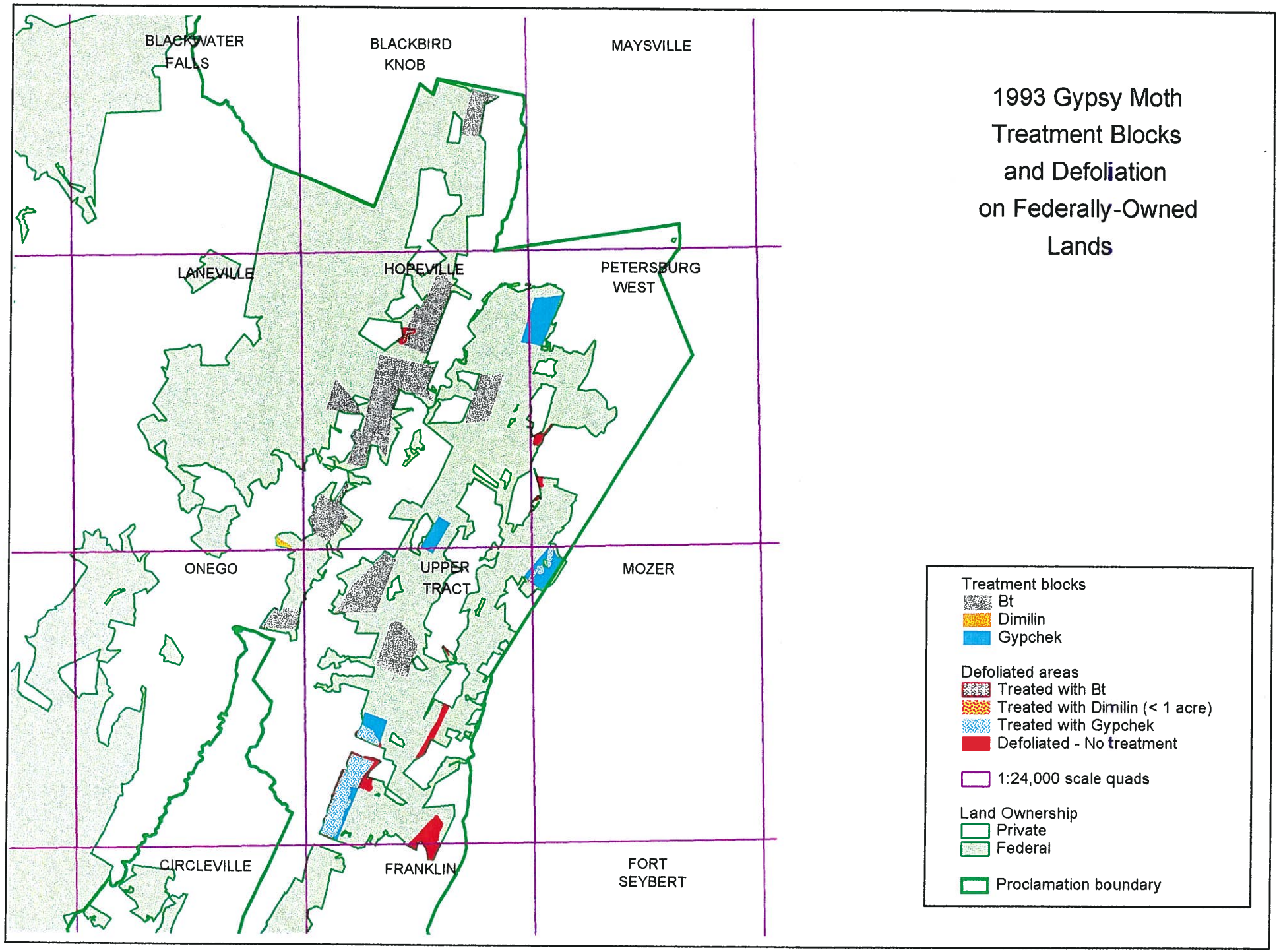



MOZARK MOUNTAIN
BLACKWATER FALLS
BLACKBIRD KNOB
MAYSVILLE
HARMAN
LANEVILLE
HOPEVILLE
PETERSBURG WEST
WHITMER
ONEGO
UPPER TRACT
MOZER
SPRUCE KNOB
CIRCLEVILLE
FRANKLIN
FORT SEYBERT
1992
Gypsy Moth
Treatment Blocks
and Defoliation
on Federally-Owned
Lands
MARLINGTON
Treatment blocks
Bt
Gypchek
Pheromone Flakes
Defoliated areas
Treated with Bt
Defoliated - No treatment
1:24,000 scale quads
Land Ownership
Private
Federal
Proclamation boundary

1992 Gypsy Moth Defoliation (percent) in Treatment Blocks on Federal Ownership within Monongahela National Forest Proclamation Boundary

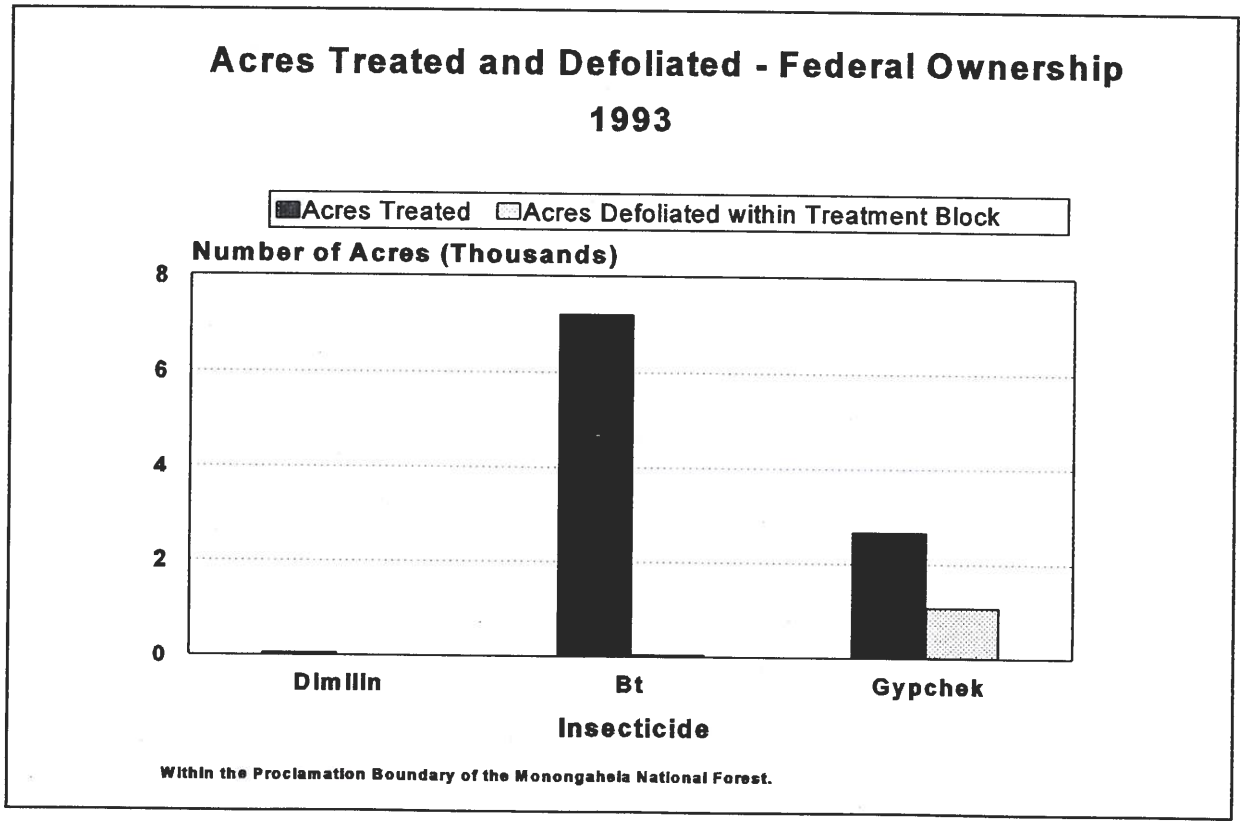
Year	Insecticide/ Pheromone	Total Treated in all Spray Blocks (acres)	Defoliation in all Spray Blocks (acres)	Portion of all Spray Blocks Defoliated (percent)
1992	Dimilin	40	0	0
	Bt	8,882	473	5
	Gypchek	455	0	0
	Pheromone Flakes	492	0	0
Total		9,869	473	5

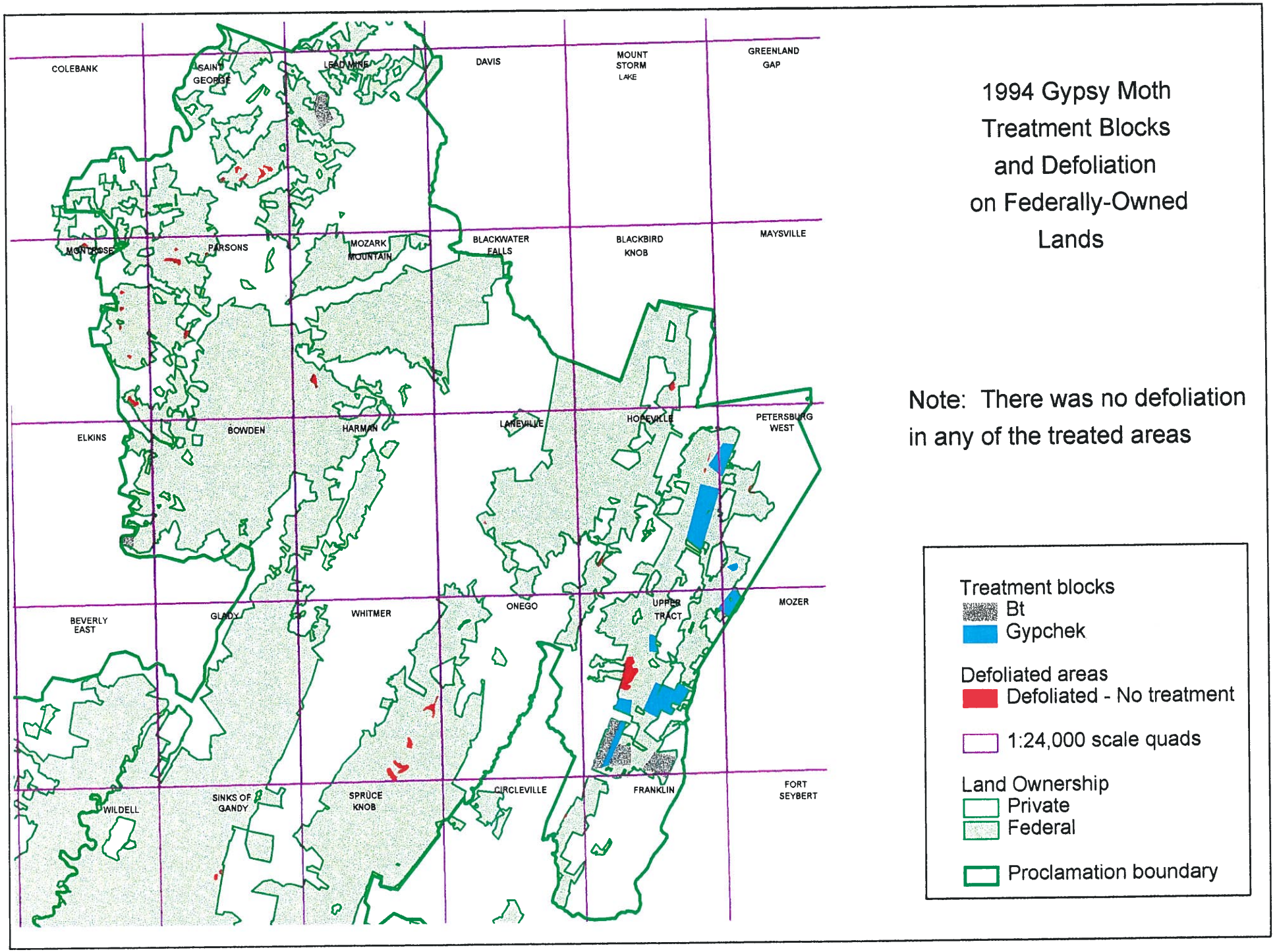



BLACKWATER FALLS
BLACKBIRD KNOB
MAYSVILLE
LANEVILLE
HOPEVILLE
PETERSBURG WEST
ONEGO
UPPER TRACT
MOZER
CIRCLEVILLE
FRANKLIN
FORT SEYBERT
1993 Gypsy Moth Treatment Blocks and Defoliation on Federally-Owned Lands
Treatment blocks
Bt
Dimilin
Gypchek
Defoliated areas
Treated with Bt
Treated with Dimilin (< 1 acre)
Treated with Gypchek
Defoliated - No treatment
1:24,000 scale quads
Land Ownership
Private
Federal
Proclamation boundary

1993 Gypsy Moth Defoliation (percent) in Treatment Blocks on Federal Ownership within Monongahela National Forest Proclamation Boundary

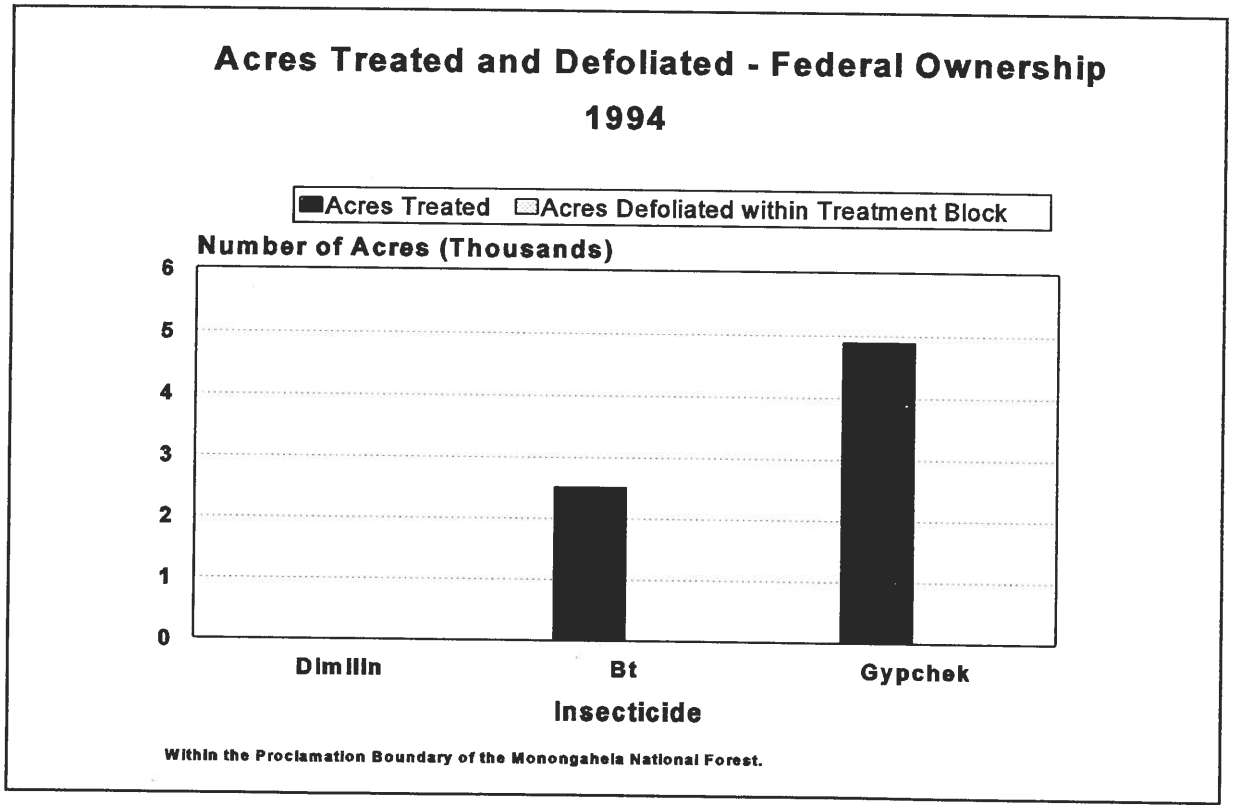
Year	Insecticide Spray Treatment	Total Treated in all Spray Blocks (acres)	Defoliation in all Spray Blocks (acres)	Portion of all Spray Blocks Defoliated (percent)
1993	Dimilin	47	1	2
	Bt	7,193	37	0.5
	Gypchek	2,651	1,082	41
Total		9,891	1,120	11

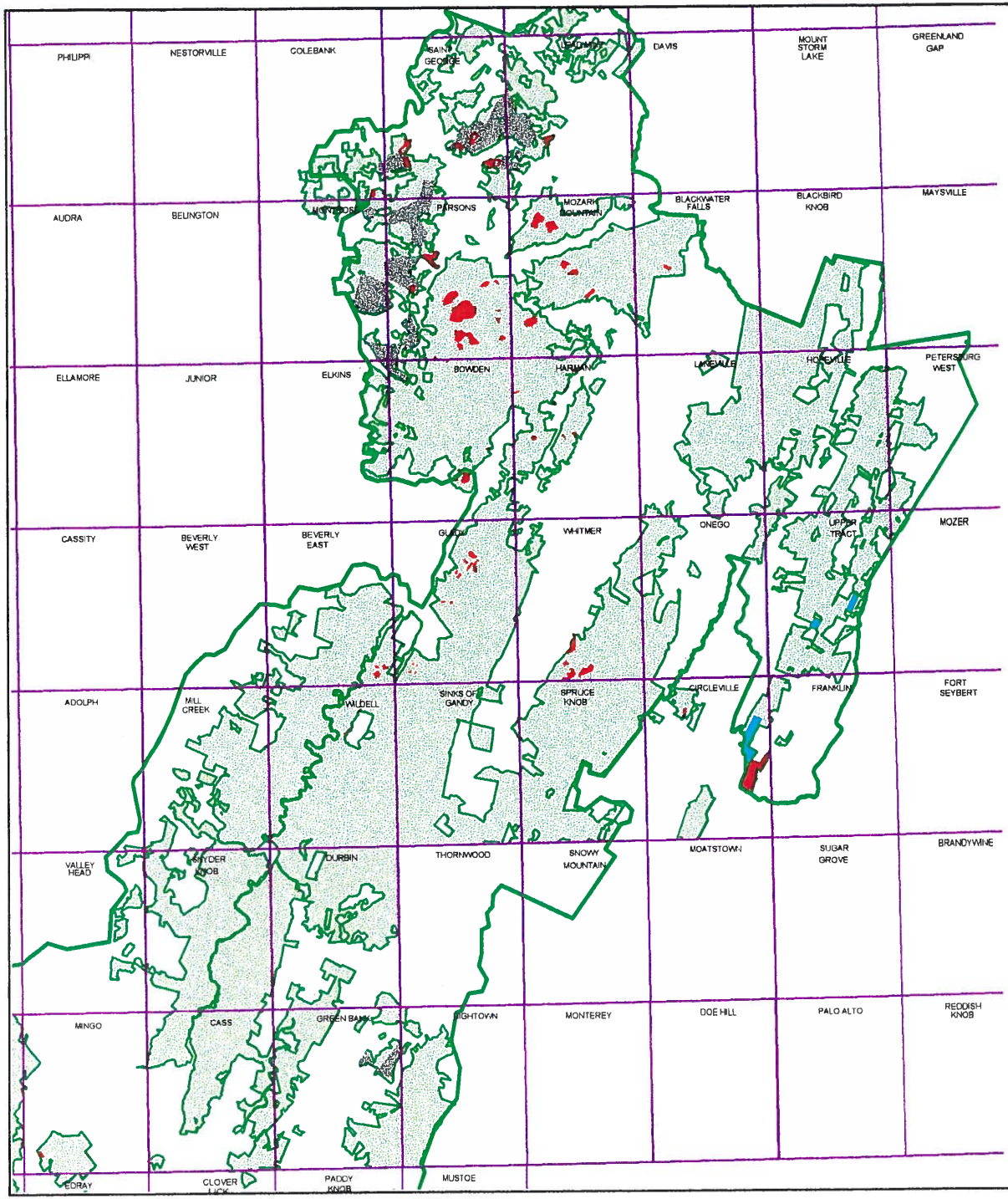



COLEBANK
SAINT GEORGE
LEADMINE
DAVIS
MOUNT STORM LAKE
GREENLAND GAP
MONTROSE
PARSONS
MOZARK MOUNTAIN
BLACKWATER FALLS
BLACKBIRD KNOB
MAYSVILLE
ELKINS
BOWDEN
HARMAN
LANEVILLE
HOPEVILLE
PETERSBURG WEST
BEVERLY EAST
GLADY
WHITMER
ONEGO
UPPER TRACT
MOZER
WILDELL
SINKS OF GANDY
SPRUCE KNOB
CIRCLEVILLE
FRANKLIN
FORT SEYBERT
1994 Gypsy Moth Treatment Blocks and Defoliation on Federally-Owned Lands
Note: There was no defoliation in any of the treated areas
Treatment blocks
Bt
Gypchek
Defoliated areas
Defoliated - No treatment
1:24,000 scale quads
Land Ownership
Private
Federal
Proclamation boundary

1994 Gypsy Moth Defoliation (percent) in Treatment Blocks on Federal Ownership within Monongahela National Forest Proclamation Boundary

Year	Insecticide Spray Treatment	Total Treated in all Spray Blocks (acres)	Defoliation in all Spray Blocks (acres)	Portion of all Spray Blocks Defoliated (percent)
1994	Dimilin	0	0	0
	Bt	2,715	0	0
	Gypchek	4,889	0	0
Total		7,604	0	0





1995 Gypsy Moth Treatment Blocks and Defoliation on Federally-Owned Lands

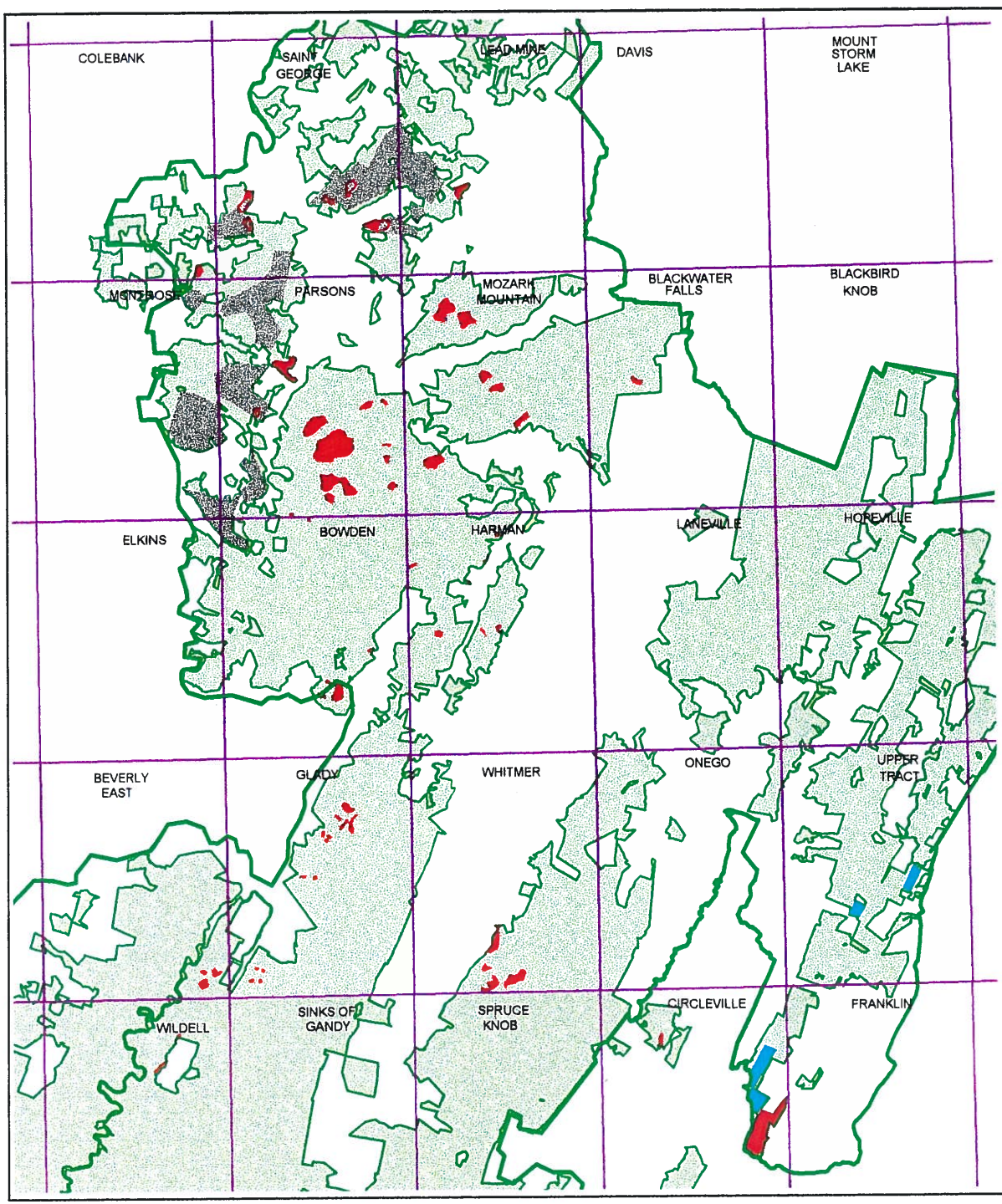
Treatment blocks
- Bt
- Gypchek

Defoliated areas
- Treated with Bt
- Defoliated - No treatment

1:24,000 scale quads

Land Ownership
- Private
- Federal

Proclamation boundary



1995 Gypsy Moth Treatment Blocks and Defoliation on Federally-Owned Lands

Northern Portion

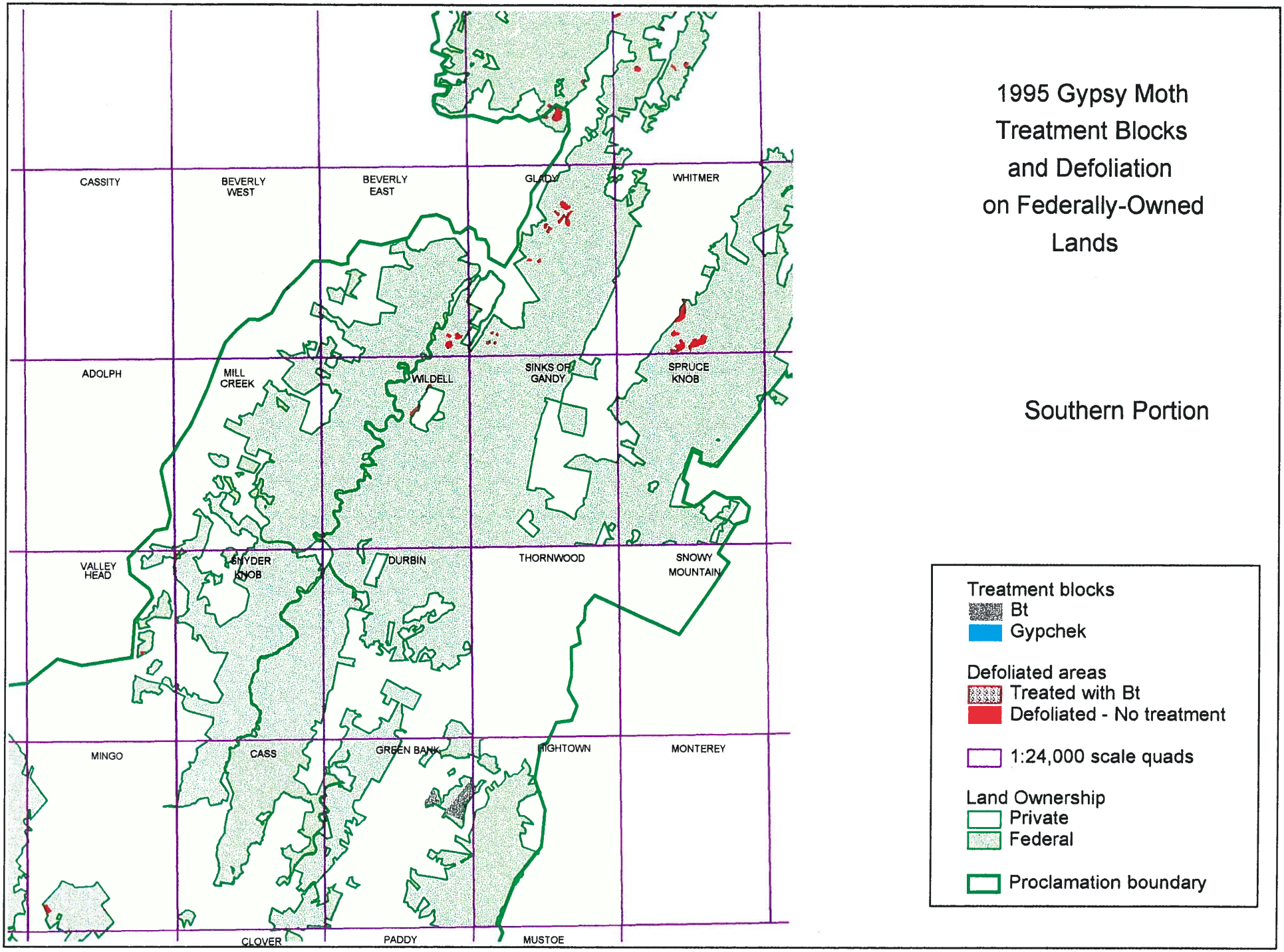
Treatment blocks
- Bt
- Gypchek

Defoliated areas
- Treated with Bt
- Defoliated - No treatment

1:24,000 scale quads

Land Ownership
- Private
- Federal

Proclamation boundary


1995 Gypsy Moth
Treatment Blocks
and Defoliation
on Federally-Owned
Lands
Southern Portion
CASSITY
BEVERLY WEST
BEVERLY EAST
GLADY
WHITMER
ADOLPH
MILL CREEK
WILDELL
SINKS OF GANDY
SPRUCE KNOB
VALLEY HEAD
SNYDER KNOB
DURBIN
THORNWOOD
SNOWY MOUNTAIN
MINGO
CASS
GREEN BANK
NIGHTOWN
MONTEREY
CLOVER
PADDY
MUSTOE
Treatment blocks
Bt
Gypchek
Defoliated areas
Treated with Bt
Defoliated - No treatment
1:24,000 scale quads
Land Ownership
Private
Federal
Proclamation boundary

1995 Gypsy Moth Defoliation (percent) in Treatment Blocks on Federal Ownership within Monongahela National Forest Proclamation Boundary

Year	Insecticide Spray Treatment	Total Treated in all Spray Blocks (acres)	Defoliation in all Spray Blocks (acres)	Portion of all Spray Blocks Defoliated (percent)
1995	Dimilin	0	0	0
	Bt	14,415	349	2
	Gypchek	975	0	0
Total		15,390	349	2